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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/699,758	11/03/2003	Weize Xu	86063PCW	4239

7590 12/29/2006

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EXAMINER	
CUTLER, ALBERT H	
ART UNIT	PAPER NUMBER
2621	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/29/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/699,758	Applicant(s) XU, WEIZE	
	Examiner Albert H. Cutler	Art Unit 2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *07/20/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This office action is responsive to Application 10/699,758 filed on November 03, 2003. Claims 1-14 are pending in the application and have been examined.

Information Disclosure Statement

The Information Disclosure Statement(IDS) mailed on July 7, 2005, was received and has been considered.

Claim Objections

1. Claims 1, 5, and 10 are objected to because of the following informalities: Lack of clarity and precision.

Consider claim 1, "the sample and hold circuits" referred to are not previously mentioned in the claim. "Sample and hold circuits" should either be removed from claim 1, and replaced with "the storage circuit elements", or used in place of the "storage circuit elements" as stated previously in the claim. Appropriate correction is required.

Also, referring to claim 1, "operational amplifier substantially averages" should be changed to, "operational amplifier produces a substantially average signal" or something of similar nature for the sake of clarity and precision. For the sake of examining, the examiner will interpret "operational amplifier substantially averages" to read, "operational amplifier produces a substantially average signal". Appropriate correction is required.

Consider claim 5, "the sample and hold circuits" referred to are not previously mentioned in the claim. "The sample and hold circuits" should either be removed from

claim 1, and replaced with "the storage circuit elements", or used in place of the "storage circuit elements" as stated previously in the claim. Appropriate correction is required.

Also, referring to claim 5, "operational amplifier averages" should be changed to, "operational amplifier produces an average signal" or something of similar nature for the sake of clarity and precision. For the sake of examining, the examiner will interpret "operational amplifier averages" to read, "operational amplifier produces an average signal". Appropriate correction is required.

Consider claim 10, "the sample and hold circuits" referred to are not previously mentioned in the claim. "The sample and hold circuits" should either be removed from claim 1, and replaced with "the storage circuit elements", or used in place of the "storage circuit elements" as stated previously in the claim. Appropriate correction is required.

Also, referring to claim 10, "operational amplifier averages" should be changed to, "operational amplifier produces an average signal" or something of similar nature for the sake of clarity and precision. For the sake of examining, the examiner will interpret "operational amplifier averages" to read, "operational amplifier produces an average signal". Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rossi et al.(US Patent 6,974,973) in view of Borg(European Patent Application Publication 1,117,250 A2).

Consider claim 1, Rossi et al. teaches:

A method for outputting signals from dark reference pixels(column 4, lines 23 through column 5, line 36), the method comprising the steps of:

(a) transferring signals from a plurality of dark reference pixels(figure 3a, "FIG. 3a shows peripheral areas 31 of a pixel array 30 which contains dark pixels from which dark current measurements are taken. The dark pixels in peripheral areas 31 are read-

out using the same signal path and timing diagram as for clear pixels in area 32 which are used for imaging." Column 4, lines 18-22) to a plurality of storage circuit elements(The pixels are transferred to "sample and hold circuits"(33, figure 3b, figure 3c, column 4, lines 24-28)). and

(b) transferring signals from each of the plurality of storage circuit elements(sample and hold circuits, 33) to an operational amplifier(35, figure 3b, column 4, lines 33-35. The pixels are transferred to a differential amplifier(i.e. operational amplifier, 35) where they are subtracted.) which operational amplifier(35) produces a signal from the signals from the sample and hold circuits(The sample and hold circuits(33) produce two signals for each pixel, Vsig and Vrst. These signals are subtracted to produce a dark current signal that is used as a reference. Column 4, lines 28-35) for providing a approximate dark reference signal(The signals output a dark reference signal which is input into an image processor(37), which uses the dark reference signals to perform sensor temperature calculations. Column 4, lines 36-40).

However, Rossi et al. does not explicitly teach that the dark pixels contained in the peripheral area of the pixel array, as shown in figure 3a, are substantially shielded from light. Rossi et al. does not explicitly teach that the pixels are read out simultaneously, or on one clock cycle, from the sample and hold circuits(33). Nor does Rossi et al. teach that the operational amplifier(35) produces a substantially average signal from all the signals in the sample and hold circuits(33).

Borg teaches of improving a reference signal obtained from dark pixels. Borg teaches that an improved reference signal is needed because many reference signals

do not accurately compensate for noise and other influences to which pixel cells are subjected(paragraph 0007). Like, Rossi et al., Borg teaches of a plurality of dark reference pixels(3, figure 2, numbers 21, 31, and 41 refer to columns of dark reference pixels, paragraph 0020). Also like Rossi et al., Borg teaches that the dark pixel outputs are fed into an operational amplifier(38, figure 2) to produce a reference signal(see figure 2, paragraph 0022).

However, in addition to the teachings of Rossi et al., Borg teaches that the dark pixels are substantially shielded from light("covered with an opaque filter that blocks light", paragraph 0021). In addition, Borg teaches that the pixels are read out simultaneously, or on one clock cycle(The pixels are read out "on a row-by-row basis", paragraph 0018. Reading pixels out "row-by-row" means that an entire row of pixels is read out at the same time(i.e. simultaneously or on one clock cycle)). Furthermore, Borg teaches that the operational amplifier(38) produces a substantially average signal from all the dark reference signals("By shorting the sense nodes of many reference pixels together, differences in the dark current from pixel to pixel, as well as shot noise associated with the dark current are averaged out" paragraph 0025. The outputs from the pixels are shorted together into the operational amplifier(38) with a common mode voltage Vcm, and an average dark reference signal is output. Paragraphs 23 and 25).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to combine the outputs of all of the sample and hold circuits of Rossi et al., as Borg does with the outputs of all the dark reference pixels, and read the dark reference values out to the operational amplifier simultaneously or on one clock

cycle as taught by Borg, in order to produce an average dark reference signal from the operational amplifier, in which the signal more accurately compensates for noise and other influences to which the pixel cells are subjected(Borg, paragraphs 0007 and 0025).

Consider claim 2, and as applied to claim 1 above, Rossi et al. further teaches that the storage circuit elements(sample and hold circuits) are sample and hold circuits(see figures 3b and 3c, column 4, lines 23-55).

Consider claim 3, and as applied to claim 2 above, Rossi et al. further teaches of providing a differential operational amplifier(35) as the operational amplifier(The sample and hold circuits(33) produce a two signals for each pixel, Vsig and Vrst. These signals are subtracted using a differential amplifier to produce a dark current signal that is used as a reference. Column 4, lines 28-35)

Consider claim 4, and as applied to claim 1 above, Rossi et al. further teaches that step (a) further comprises transferring the pixel signals from the plurality of pixels to the plurality of storage elements(sample and hold circuits) on a row-by-row basis("The sample and hold circuits 33 sample signals from array 30 row-by-row" column 4, lines 25-29).

Consider claim 5, Rossi et al. teaches:

An image sensor assembly(figures 3a 3b and 3c) comprising:

(a) a plurality of active pixels(figure 3a, 32, "clear pixels") that receives incident light that is converted into a charge("Imaging sensors are used to capture visible light", column 1, line 15);

(b) a plurality of storage element circuits(sample and hold circuits(33));

(c) a plurality of dark reference pixels(figure 3a, "FIG. 3a shows peripheral areas 31 of a pixel array 30 which contains dark pixels from which dark current measurements are taken. The dark pixels in peripheral areas 31 are read-out using the same signal path and timing diagram as for clear pixels in area 32 which are used for imaging." Column 4, lines 18-22) each of which is responsive to light(because the dark pixels are constructed on the same image sensor as the light ones(figure 3a), they are thus, responsive to light), wherein signals from each of the dark reference pixels is transferred to one of the storage element circuits(The dark pixels in peripheral areas 31 are read-out using the same signal path and timing diagram as for clear pixels in area 32 which are used for imaging." Column 4, lines 18-22. Each pixel provides two signals, Vsig and Vref to a sample and hold circuit(33). Column 4, lines 45-49); and

(d) an operational amplifier that receives a signal from each of the sample and hold circuits(35, figure 3b, column 4, lines 33-35. The pixels are transferred to a differential amplifier(i.e. operational amplifier, 35) where they are subtracted.), wherein the operational amplifier(35) produces a signal from the signals from the sample and hold circuits(The sample and hold circuits(33) produce two signals for each pixel, Vsig and Vrst. These signals are subtracted to produce a dark current signal that is used as

a reference. Column 4, lines 28-35) for providing an approximate dark reference pixel (The signals output a dark reference signal which is input into an image processor(37), which uses the dark reference signals to perform sensor temperature calculations. Column 4, lines 36-40)

However, Rossi et al. does not explicitly teach that the dark pixels contained in the peripheral area of the pixel array, as shown in figure 3a, are substantially shielded from light. Rossi et al. does not explicitly teach that the pixels are read out simultaneously, or on one clock cycle, from the sample and hold circuits(33). Nor does Rossi et al. teach that the operational amplifier(35) produces a substantially average signal from all the signals in the sample and hold circuits(33).

Borg teaches of improving a reference signal obtained from dark pixels. Borg teaches that an improved reference signal is needed because many reference signals do not accurately compensate for noise and other influences to which pixel cells are subjected(paragraph 0007). Like, Rossi et al., Borg teaches of a plurality of dark reference pixels(3, figure 2, numbers 21, 31, and 41 refer to columns of dark reference pixels, paragraph 0020). Also like Rossi et al., Borg teaches that the dark pixel outputs are fed into an operational amplifier(38, figure 2) to produce a reference signal(see figure 2, paragraph 0022).

However, in addition to the teachings of Rossi et al., Borg teaches that the dark pixels are substantially shielded from light("covered with an opaque filter that blocks light", paragraph 0021). In addition, Borg teaches that the pixels are read out simultaneously, or on one clock cycle(The pixels are read out "on a row-by-row basis",

paragraph 0018. Reading pixels out "row-by-row" means that an entire row of pixels is read out at the same time(i.e. simultaneously or on one clock cycle)). Furthermore, Borg teaches that the operational amplifier(38) produces a substantially average signal from all the dark reference signals("By shorting the sense nodes of many reference pixels together, differences in the dark current from pixel to pixel, as well as shot noise associated with the dark current are averaged out" paragraph 0025. The outputs from the pixels are shorted together into the operational amplifier(38) with a common mode voltage Vcm, and an average dark reference signal is output. Paragraphs 23 and 25).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to combine the outputs of all of the sample and hold circuits of Rossi et al., as Borg does with the outputs of all the dark reference pixels, and read the dark reference values out to the operational amplifier simultaneously or on one clock cycle as taught by Borg, in order to produce an average dark reference signal from the operational amplifier, in which the signal more accurately compensates for noise and other influences to which the pixel cells are subjected(Borg, paragraphs 0007 and 0025).

Consider claim 6, and as applied to claim 5 above, Rossi et al. further teaches that the storage circuit elements(sample and hold circuits) are sample and hold circuits(see figures 3b and 3c, column 4, lines 23-55).

Consider claim 7, and as applied to claim 6 above, Rossi et al. further teaches:

each of the sample and hold circuits further comprises a charge storage element(Cvsig and Cvrst, see figure 3c) mated to each signal from the dark reference pixels(see figure 3c, the each column line represents the output from one dark pixel. Cvsig is mated to the Vsig signal of a dark pixel and Cvrst is mated to a Vrst signal of a dark pixel.), wherein a signal from each charge storage element(Cvsig and Cvrst, figure 3c) is passed to the operational amplifier(See figure 3b, Vsig and Vrst signals are fed into the two opposite terminals of the operational amplifier respectively. Column 4, lines 30-35).

Consider claim 8, and as applied to claim 5 above, Rossi et al. further teaches of providing a differential operational amplifier(35) as the operational amplifier(The sample and hold circuits(33) produce a two signals for each pixel, Vsig and Vrst. These signals are subtracted using a differential amplifier to produce a dark current signal that is used as a reference. Column 4, lines 28-35)

Consider claim 9, and as applied to claim 5 above, Rossi et al. further teaches that step (a) further comprises transferring the pixel signals from the plurality of pixels to the plurality of storage elements(sample and hold circuits) on a row-by-row basis("The sample and hold circuits 33 sample signals from array 30 row-by-row" column 4, lines 25-29).

Consider claim 10, Rossi et al. teaches:

A camera(The image sensor is used to capture visible light(i.e. it functions as a camera)column 1, line 15) comprising:

An image sensor(figures 3a 3b and 3c) comprising:

(a) a plurality of active pixels(figure 3a, 32, "clear pixels") that receives incident light that is converted into a charge("Imaging sensors are used to capture visible light", column 1, line 15);

(b) a plurality of storage element circuits(sample and hold circuits(33));

(c) a plurality of dark reference pixels(figure 3a, "FIG. 3a shows peripheral areas 31 of a pixel array 30 which contains dark pixels from which dark current measurements are taken. The dark pixels in peripheral areas 31 are read-out using the same signal path and timing diagram as for clear pixels in area 32 which are used for imaging." Column 4, lines 18-22) each of which is responsive to light(because the dark pixels are constructed on the same image sensor as the light ones(figure 3a), they are thus, responsive to light), wherein signals from each of the dark reference pixels is transferred to one of the storage element circuits(The dark pixels in peripheral areas 31 are read-out using the same signal path and timing diagram as for clear pixels in area 32 which are used for imaging." Column 4, lines 18-22. Each pixel provides two signals, Vsig and Vref to a sample and hold circuit(33). Column 4, lines 45-49); and

(d) an operational amplifier that receives a signal from each of the sample and hold circuits(35, figure 3b, column 4, lines 33-35. The pixels are transferred to a differential amplifier(i.e. operational amplifier, 35) where they are subtracted.), wherein

the operational amplifier(35) produces a signal from the signals from the sample and hold circuits(The sample and hold circuits(33) produce two signals for each pixel, Vsig and Vrst. These signals are subtracted to produce a dark current signal that is used as a reference. Column 4, lines 28-35) for providing an approximate dark reference pixel (The signals output a dark reference signal which is input into an image processor(37), which uses the dark reference signals to perform sensor temperature calculations. Column 4, lines 36-40)

However, Rossi et al. does not explicitly teach that the dark pixels contained in the peripheral area of the pixel array, as shown in figure 3a, are substantially shielded from light. Rossi et al. does not explicitly teach that the pixels are read out simultaneously, or on one clock cycle, from the sample and hold circuits(33). Nor does Rossi et al. teach that the operational amplifier(35) produces a substantially average signal from all the signals in the sample and hold circuits(33).

Borg teaches of improving a reference signal obtained from dark pixels. Borg teaches that an improved reference signal is needed because many reference signals do not accurately compensate for noise and other influences to which pixel cells are subjected(paragraph 0007). Like, Rossi et al., Borg teaches of a plurality of dark reference pixels(3, figure 2, numbers 21, 31, and 41 refer to columns of dark reference pixels, paragraph 0020). Also like Rossi et al., Borg teaches that the dark pixel outputs are fed into an operational amplifier(38, figure 2) to produce a reference signal(see figure 2, paragraph 0022).

However, in addition to the teachings of Rossi et al., Borg teaches that the dark pixels are substantially shielded from light("covered with an opaque filter that blocks light", paragraph 0021). In addition, Borg teaches that the pixels are read out simultaneously, or on one clock cycle(The pixels are read out "on a row-by-row basis", paragraph 0018. Reading pixels out "row-by-row" means that an entire row of pixels is read out at the same time(i.e. simultaneously or on one clock cycle)). Furthermore, Borg teaches that the operational amplifier(38) produces a substantially average signal from all the dark reference signals("By shorting the sense nodes of many reference pixels together, differences in the dark current from pixel to pixel, as well as shot noise associated with the dark current are averaged out" paragraph 0025. The outputs from the pixels are shorted together into the operational amplifier(38) with a common mode voltage Vcm, and an average dark reference signal is output. Paragraphs 23 and 25).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to combine the outputs of all of the sample and hold circuits of Rossi et al., as Borg does with the outputs of all the dark reference pixels, and read the dark reference values out to the operational amplifier simultaneously or on one clock cycle as taught by Borg, in order to produce an average dark reference signal from the operational amplifier, in which the signal more accurately compensates for noise and other influences to which the pixel cells are subjected(Borg, paragraphs 0007 and 0025).

Consider claim 11, and as applied to claim 10 above, Rossi et al. further teaches that the storage circuit elements(sample and hold circuits) are sample and hold circuits(see figures 3b and 3c, column 4, lines 23-55).

Consider claim 12, and as applied to claim 11 above, Rossi et al. further teaches:

each of the sample and hold circuits further comprises a charge storage element(Cvsig and Cvrst, see figure 3c) mated to each signal from the dark reference pixels(see figure 3c, the each column line represents the output from one dark pixel. Cvsig is mated to the Vsig signal of a dark pixel and Cvrst is mated to a Vrst signal of a dark pixel.), wherein a signal from each charge storage element(Cvsig and Cvrst, figure 3c) is passed to the operational amplifier(See figure 3b, Vsig and Vrst signals are fed into the two opposite terminals of the operational amplifier respectively. Column 4, lines 30-35).

Consider claim 13, and as applied to claim 10 above, Rossi et al. further teaches of providing a differential operational amplifier(35) as the operational amplifier(The sample and hold circuits(33) produce a two signals for each pixel, Vsig and Vrst. These signals are subtracted using a differential amplifier to produce a dark current signal that is used as a reference. Column 4, lines 28-35)

Consider claim 14, and as applied to claim 10 above, Rossi et al. further teaches that step (a) further comprises transferring the pixel signals from the plurality of pixels to

the plurality of storage elements(sample and hold circuits) on a row-by-row basis("The sample and hold circuits 33 sample signals from array 30 row-by-row" column 4, lines 25-29).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent Application Publication 2003/0052982 contains a substantially similar structure for averaging a reference pixel signal. See figure 3B.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Albert H. Cutler whose telephone number is (571)-270-1460. The examiner can normally be reached on Mon-Fri (7:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached on (571)-272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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